What is claimed is:

1. A power supply apparatus, comprising:

a power converter circuit for converting an input voltage from an input power supply;

an LC filter for smoothing an output of said power converter circuit and supplying the smoothed output to a load; and

a controller for controlling said power converter circuit based on an output voltage of the LC filter, and

wherein a transfer function G of said controller is represented by:

$$\frac{N_2 s^2 + N_1 s + N_0}{s^2 + D_1 s + D_0}$$

(N0, N1, N2, D0 and D1 are coefficients),

where a root of a numerator thereof is a real number, and a loop transfer function including a transfer function of said power converter circuit, said LC filter, and said load, and said transfer function G of said controller has an open loop characteristic that a gain margin is omitted.

2. An power supply apparatus, comprising:

a power converter circuit for converting an input voltage from an input power supply;

an LC filter for smoothing an output of said power converter circuit and supplying the smoothed output to a load; and

a controller for controlling said power converter circuit based on an output voltage of said LC filter, and

wherein a transfer function G of said controller is represented by:

$$\frac{N_2 s^2 + N_1 s + N_0}{s^2 + D_1 s + D_0}$$

(N0, N1, N2, D0 and D1 are coefficients),

where a root of a numerator thereof is a real number, and a loop transfer function including a transfer function of said power converter circuit, said LC filter, and said load, and said transfer function G of said controller has an open loop characteristic that only a phase margin is selectively secured among said phase margin and a gain margin.

3. A power supply apparatus, comprising:

a power converter circuit for converting an input voltage from an input direct current power supply;

an LC filter for smoothing an output of said power converter circuit and supplying the smoothed output to a load; and

a controller for controlling said power converter circuit based on an output voltage of said LC filter, and

wherein a transfer function G of said controller is represented by:

$$\frac{N_2 s^2 + N_1 s + N_0}{s^2 + D_1 s + D_0}$$

(N0, N1, N2, D0 and D1 are coefficients),

in which a root of a numerator thereof is a real number, and a loop transfer function including a transfer function of said power converter circuit, said LC filter, and said load, and said transfer function G of said controller has an open loop characteristic that a gain exceeds 0 dB at a frequency at which a phase becomes -180 degrees.

4. The power supply apparatus as set forth in claim 3, wherein said frequency at which said phase becomes -180 degrees is set in a frequency range from a resonance frequency of said LC filter to a gain crossover frequency.

5. A power supply apparatus, comprising:

a power converter circuit for converting an input voltage from an input direct current power supply;

an LC filter for smoothing an output of said power converter circuit and supplying the smoothed output to a load; and

a controller for controlling said power converter circuit based on an output voltage of the LC filter, and

wherein a transfer function G of said controller is represented by:

$$\frac{N_2 s^2 + N_1 s + N_0}{s^2 + D_1 s + D_0}$$

(N0, N1, N2, D0 and D1 are coefficients),

where a root of a numerator thereof is a real number, and a loop transfer function including a transfer function of said power converter circuit, said LC filter, and said load, and said transfer function G of said controller has an open loop characteristic that a gain exceeds 0 dB at a frequency at which a phase is mostly delayed.

6. The power supply apparatus as set forth in claim 5, wherein said frequency with at which said phase is mostly delayed is set in a frequency range from a resonance frequency of said LC filter to a gain crossover frequency.

7. A power supply apparatus, comprising:

a power converter circuit for converting an input voltage from

an input direct current power supply;

an LC filter for smoothing an output of said power converter circuit and supplying the smoothed output to a load; and

a controller for controlling said power converter circuit based on an output voltage of the LC filter, and

wherein said controller has a PID control function whose transfer function G is represented by:

$$\frac{N_2 s^2 + N_1 s + N_0}{s^2 + D_1 s + D_0}$$

(N0, N1, N2, D0 and D1 are coefficients),

in which a root of a numerator thereof is a real number, and at frequencies higher than a resonance frequency of said LC filter, an integral control element is applied.

8. The power supply apparatus as set forth in claim 7, wherein said controller applies a differential control element at frequencies that are lower than a gain crossover frequency.